

*FLUE GAS WASHER WITH A SUPPORT ~~ING-CONSTRUCTION~~ STRUCTURE FOR  
SPRAY PIPES*

CROSS REFERENCE TO RELATED APPLICATIONS

This application is the US national phase of PCT  
5 application PCT/DE2002/003776, filed 5 October 2002, published 22  
April 2004 as WO 2004/033071, and claiming the priority of PCT  
patent application PCT/DE2002/003776 itself filed 5 October 2002,  
whose entire disclosures are herewith incorporated by reference.

FIELD OF THE INVENTION

10 The present invention is directed to a flue gas washer  
with a support ~~ing-construction~~ structure for spray pipes for  
cleaning at least one horizontally disposed droplet separator  
system which is formed by droplet separator ~~packet~~ packs which  
are supported on ~~carrier~~ supports.

15 BACKGROUND OF THE INVENTION

Normally, flue gas washers have at least one coarse  
separator stage and one fine separator stage which are disposed  
one above the other on a respective ~~carrier~~ support system with a  
~~height distance which~~ vertical spacing that allows a manual  
20 inspection between the two separator stages. Each separator  
stage consists of a plurality of identical separator members  
which are droplet separator ~~packet~~ packs ~~put together~~ formed by  
individual droplet separator lamellae respectively.

Such droplet separator systems have to be periodically  
25 cleaned since they contaminate with continuous use. For this,

one has incorporated spray pipes into the flue gas washers normally above, below and between the individual droplet separator systems so that they ~~[[same]]~~ can be sprayed with an appropriate cleaning medium (water) on both sides for cleaning purposes. The spray pipes are carried by support ing construction structures which assure a uniform distribution of the spray pipes over the cross-section of the flue gas washer.

It is known to dispose the support ing ~~construction structures~~ for the spray pipes at the carrier supports on which the droplet separator ~~packet~~ packs are supported. For instance, these support ing ~~construction structures~~ are defined by ~~supporting member~~ posts extending upwardly and downwardly from the carrier supports and supporting corresponding supporting frames on which the spray pipes are disposed.

Such systems have to be inspected and cleaned periodically in order to maintain the operability of the spray pipes. However, inspections can be carried out only in a difficult manner with such systems since the support ing construction structure for the spray pipes consisting of the ~~supporting member~~ posts arranged at the carrier supports and the supporting frame for the spray pipes hinders ~~a traversing~~ access which has to be carried out ~~in the range of~~ near the carrier supports. Accordingly, inspections, especially cleaning processes, which have to be carried out at a point of time necessarily can be carried out only with more difficult circumstances with such systems.

The above-cited difficulties exist always if the support ~~ing construction~~ structure for the spray pipes is disposed at the carrier supports for the droplet separator systems since in this manner the space above and below the carrier supports is occupied by the ~~supporting member posts~~ and the supporting frames crossing the carrier supports. In many cases these supporting frames are also connected to the washer wall itself so that in this ~~[[range]]~~ area ~~a traversing access~~ is made more difficult ~~either~~ also.

Accordingly, in order to arrange the spray pipes in flue gas washers their support ~~ing construction~~ structures have to be mounted at the carrier supports for the droplet separator systems and thus at the washer itself. This means an additional effort for the manufacturer of the washer since the same has to supply a thoroughly adjusted embodiment with an exact size which has to be considered critically, especially if the carrier support systems ~~obtain~~ have an anti-corrosion coating, for instance a rubber coating.

#### OBJECT OF THE INVENTION

It is the object of the present invention to provide a flue gas washer of the cited kind which can be inspected in an especially simple manner.

#### SUMMARY OF THE INVENTION

According to the invention this object is achieved with a flue gas washer of the cited kind by the feature that the

support ~~ing construction~~ structure for the spray pipes is disposed at or between the droplet separator ~~packet~~ packs.

The decisive difference of the inventive solution with respect to the above-cited prior art consists in the feature that  
5 the support ~~ing construction~~ structure for the spray pipes is not directly connected to the construction of the flue gas washer, for instance the carrier supports thereof, but is rather disposed at or between the droplet separator ~~packet~~ packs and is also installed together with ~~the~~ same. This has the advantage that  
10 the manufacturer of the flue gas washer ~~[[has]]~~ does not have to take into consideration the mounting of the support ~~ing construction~~ structure for the spray pipes or ~~has to already~~ provide his system with such a support ~~ing construction~~ structure but that the support ~~ing construction~~ structure can be provided  
15 with the spray pipes when the droplet separator system or droplet separator systems are installed. Accordingly, the support ~~ing construction~~ structure forms a component of the separator system.

The space above and below the carrier supports for the supporting of the droplet separator ~~packet~~ packs is kept free by  
20 the inventive shifting of the support ~~ing construction~~ structure to the separator system and the mounting of ~~the~~ same at or between the individual droplet separator members or droplet separator ~~packet~~ packs. Accordingly, the support ~~ing construction~~ structure is shifted to the ~~[[range]]~~ space between  
25 the carrier supports whereby ~~traversing path~~ access passages for inspection purposes are provided above and below the carrier

supports which are not interrupted by ~~supporting member posts~~ or carrier support elements running in transverse direction. The height of these ~~traversing path~~ access passages is determined by the distance between the supporting systems for the droplet separator systems.

The carrier supports, which are supported on the individual separator packet packs which form the separator systems, are normally double-T-beams (H-beams) or hollow profiles on the upper flanges of which the individual separator packet packs are located. According to the prior art the space between adjacent separator packet packs was used for ~~[[the]]~~ mounting ~~[[of]]~~ the vertical ~~supporting member posts~~ so that the space above the carrier supports could no more be ~~traversed~~ traveled. According to the invention now the support ~~ing construction~~ structure is shifted away from the carrier support to the left and to the right so far that a sufficiently large free space results is formed in the ~~[[range]]~~ space above and below the carrier support which enables ~~a traversing of~~ access to the system for inspection purposes. The support ~~ing construction~~ structure is carried by the separator packet packs themselves or is disposed between ~~the~~ same (if a plurality of separator packet packs are arranged between adjacent carrier supports) wherein so that, in the last cited case, they are carried by the separator system consisting of the plurality of separator packet packs. Of course, the separator packet packs are formed or connected to one

another in such a manner that they can carry the support ing  
construction structure.

With such embodiments according to which the support  
ing ~~construction~~ structure for the spray pipes is disposed at the  
5 droplet separator ~~packet~~ packs preferably the droplet separator  
~~packet~~ packs have reinforced end portions for the arrangement of  
carrying the support ing ~~construction~~ structure. These  
reinforced end portions do not have ~~[[not]]~~ to extend over the  
whole width of the droplet separator ~~packet~~ packs but can form  
10 only a part herefrom thereof. Preferably, the reinforced end  
portions are formed in a box-like manner.

According to this embodiment the reinforced end  
portions are appropriately penetrated by at least one rod-like  
~~supporting member~~ post wherein the ~~supporting member~~ post, which  
15 is provided for the support ing ~~construction~~ structure of the  
spray pipes, can extend on one side or on both sides upwardly  
and/or downwardly out of the reinforced end portions (boxlike  
portions) of the droplet separator ~~packet~~ packs.

Preferably, the support ing ~~construction~~ structure for  
20 the spray pipes is formed by a spray pipe carrying member by  
means of which a plurality of ~~supporting member~~ posts, especially  
two, are connected to one another. So, for instance, a droplet  
separator ~~packet~~ pack with reinforced end portions can be  
provided between two adjacent ~~carrier~~ supports wherein both  
25 reinforced end portions are penetrated by a respective ~~supporting~~  
~~member~~ post which extends upwardly and downwardly and wherein the

two ~~supporting member posts~~ are connected by a carrying member above and below on which, for instance, two spray pipes are disposed which extend parallel with respect to the carrier supports. Of course, the ~~supporting member posts~~ are fixed at the reinforced end portions of the droplet separator ~~packet~~ packs so that, on the whole, a stable good bearing formation is generated.

According to another embodiment the rod-like ~~supporting member posts~~ consist of several parts and have a connecting point outside of the reinforced end portion. Here, for instance, a ~~supporting member post~~ extends through the reinforced (box-like) end portion and serves as holding device for further ~~supporting member posts~~ extending downwardly and/or upwardly and holding the carrying members for the spray pipes. For instance, the ~~supporting member posts~~ can be screwed with one another.

If possible, one can also desist from the ~~supporting member post~~ penetrating the reinforced end portions so that the ~~supporting member posts~~ are fastened only at the outside of the reinforced (box-like) end portions, for instance through flanges which are provided there.

According to still another embodiment the reinforced end portions are formed in such a manner that rod-like ~~supporting member posts~~ can be inserted into the same. Here the reinforced (box-like) end portion has a slot at the upper side, for example, through which the ~~supporting member post~~ is inserted. In its

interior the end portion has an appropriate reception device for the ~~supporting member post~~.

Preferably, the ~~supporting member posts~~ are formed in a rod-like manner, i.e. they have no great extension in the direction parallel with respect to the ~~carrier supports~~. For this suitable flat profiles can be used. The small extension in the direction parallel with respect to the ~~carrier supports~~ has the advantage that an inspection of the separator ~~packet packs~~ is possible from the ~~traversing path~~ access passages above and below the ~~carrier supports~~.

Preferably, the separator ~~packet packs~~ are provided with the reinforced end portions directly by the manufacturer so that a one-part formation results. However, it is not excluded that the reinforced end portions are mounted to the separator ~~packet packs~~ by means of removable or not-removable connections.

Of course, not all the droplet separator ~~packet packs~~ have to be provided with reinforced end portions. If, for instance, three or more separator ~~packet packs~~ are disposed between adjacent ~~carrier supports~~ only the two ~~packet packs~~ adjacent to the ~~carrier supports~~ can be reinforced at their end portions adjacent to the ~~carrier supports~~ while the central ~~packet pack~~ is formed normally and the two central end portions of the two outer ~~packet packs~~ are not reinforced either. It is essential that only those separator ~~packet packs~~ carrying the support ~~ing construction~~ structure for the spray pipes have reinforced end portions or only one reinforced end portion.



It was already mentioned that the reinforced end portions preferably extend only over a part of the width of the separator packet packs. So, the same are preferably centrally disposed with respect to the width of the packet packs while  
5 normal lamellae of the separator packet pack are disposed on both sides of the reinforced (box-like) portion. Accordingly, the reinforced end portions form a reinforced or stiffened core suitable for carrying the ~~support ing~~ construction structure.

According to another embodiment of the invention the  
10 ~~support ing~~ construction structure is formed by ~~supporting member posts~~ which are disposed between adjacent droplet separator packet packs respectively. This embodiment is used if between two adjacent carrier supports two or more droplet separator packet packs are provided which are connected with one another by  
15 means of suitable connection means, for instance flange connections. According to the invention here the ~~supporting member post~~ is disposed at the connection point between two droplet separator packet packs and is connected to the adjacent packet packs so that the same commonly carry the ~~supporting member post~~.  
20 ~~member post~~. Of course, it is also possible according to the invention to provide two short droplet separator packet packs instead of one long packet pack and to install a ~~supporting member post~~ at the connection point between the same.

Preferably, the ~~supporting member posts~~ are connected  
25 to the separator packet packs by means of flange connections.

According to this embodiment the vertical ~~supporting~~  
member posts carry the spray pipes preferably directly. However  
this does not exclude that also in this case carrying members on  
which the spray pipes are disposed can be provided between  
5 ~~supporting member posts~~.

Also in this embodiment the ~~supporting member posts~~ are  
formed in a rod-like manner or have the shape of a slim plate.  
They can be adapted to the lamellar shape of the ~~packet~~ packs in  
the ~~[[range]]~~ space between the adjacent separator ~~packet~~ packs,  
10 for instance not formed rectilinearly in this ~~[[range]]~~ space but  
adapted to the angular or curve-like course of the lamellae.

According to the last cited embodiment normally a  
reinforcement of the end portions of the droplet separator ~~packet~~  
packs is not necessary. However, such a reinforcement at the end  
15 portions between which a ~~supporting member post~~ is disposed is  
not excluded.

Generally, stable and flexible materials, as for  
instance special steel but also plastics, as glass-reinforced  
plastics, are used as materials for the support ~~ing construction~~  
20 structure. Even the spray pipes can consist of glass-reinforced  
plastics. In this case one can work with especially large  
supporting distances which, for instance, are three times larger  
than with polypropylene. ~~Furthermore, the invention is directed~~  
~~to a support ing construction structure for the use in a flue gas~~  
25 ~~washer according to one of the patent claims 1-11.~~

#### BRIEF DESCRIPTION OF THE DRAWING

In the following the invention is described by means of examples in connection with the drawing in detail. Of the drawing

Figure 1 shows a side view of a part of a flue gas washer;

Figure 2 shows an enlarged view of a part of the flue gas washer of figure 1;

Figure 3 shows a top view on a part of the flue gas washer of figures 1 and 2 in a reduced scale;

Figure 4 shows a view of a part of the flue gas washer along line C-D in figure 2;

Figure 5 shows details of the flue gas washer of the preceding figures with other embodiments of the support ing construction structure for the spray pipes;

Figures 6a, b and c show a top view, a side view and a sectional view along line A-B in figure 6a of a droplet separator packet pack;

Figure 7 shows another embodiment of a support ing construction structure for spray pipes of a flue gas washer in a side view; and

Figure 8 shows the embodiment of figure 7 in a view turned around 90°.

#### SPECIFIC DESCRIPTION

Figure 1 shows a vertical section through a part of a flue gas washer 1 which is formed as a standing cylinder. The flow direction of the flue gases is indicated by arrows and

extends in figure 1 from below to above. In the flue gas washer 1 a lower coarse separator system 4 and an upper fine separator system 3 are disposed which consist of individual droplet separator ~~packets~~ packs 15 ~~, respectively~~. Each droplet separator ~~packet~~ pack 15 is supported with its end on two ~~carrier~~ supports 2 which extend over the cross-section of the flue gas washer.

Each droplet separator ~~packet~~ pack 15 consists of a plurality of droplet separator lamellae disposed parallel with respect to another and ~~flown through~~ traversed by the flue gas flow and deflecting the flow ~~[[ing]]~~ of the flue gas flow in order to cause a separation of the entrained droplets in this manner. Such droplet separators are known and do not form part of the present invention.

Each droplet separator ~~packet~~ pack 15 has in its end portions reinforced box-like portions 6 with which the ~~packet~~ pack 15 lies on the ~~carrier~~ supports 2. These reinforced end portions 6 carry a support ~~ing construction~~ structure 7 for spray pipes extending parallel with respect to the ~~carrier~~ supports 2 and serving for cleaning of the droplet separator systems. The corresponding spraying cones are shown on the left upper side of figure 1. The spray pipes 8 are disposed above and below the separator systems 3 and 4 so that the separator ~~packets~~ packs 15 are cleaned from above and from below.

The support ~~ing construction~~ structure 7 has vertical rod-like ~~supporting member~~ posts 9 extending through the box-like

reinforced end portions 6 and anchored in the same. Accordingly, these rod-like ~~supporting member posts~~ 9 extend upwardly and downwardly from the reinforced end portions 6 and carry at their ends spray pipe carrying elements 10 connecting two ~~supporting member posts~~ 9 with one another.

Figure 2 shows the exact design of the supporting construction structure for the spray pipes 8. One recognizes that the fine separator system 3 consists of a droplet separator ~~packet pack~~ 15 lying on ~~[[the]]~~ two double-T-beams (H-beams) 2. Exactly ~~spoken~~ More specifically, the droplet separator ~~packet pack~~ 15 has two reinforced box-like end portions 6 ~~serving as~~ that bear ~~[[ings]]~~ on the ~~carrier supports~~. Furthermore, these reinforced end portions 6 serve for the anchoring of respective vertical ~~supporting member posts~~ 9 extending upwardly and downwardly from the separator system and provided at their end portions with spray pipe carrying elements 10. As shown in figure 2, two spray pipes 8 are located on each spray pipe carrying element 10.

Furthermore, one recognizes from figure 2 that ~~traversing path~~ access passages 11 for inspections etc. are formed above and below the ~~carrier supports~~ 2 which can be ~~traversed~~ traveled by a service person for inspection purposes etc. Since the ~~supporting member posts~~ 9 extend only over a relatively short distance in the direction perpendicular to the ~~paper sheet view~~ plane ~~[[an]]~~ inspection of the separator systems 3, 4 from the ~~traversing path~~ access passages 11 is possible.

Figure 3 shows a top view on about a quarter of the cross-section of the flue gas washer 1. One recognizes the ~~traversing path~~ access passages 11 formed over the ~~carrier~~ supports 2 which are shown ~~[[in a]]~~ hatched manner. The spray pipes 8 are located between the ~~carrier~~ supports 2 and are supported on the carrying elements 10, wherein two spray pipes 8 ~~[[are]]~~ being disposed between two ~~carrier~~ supports 2 ~~7~~ respectively.

Figure 4 shows a view of the ~~support ing construction~~ structure 7 for the spray pipes 8 in a position turned around 90° with respect to the view of figure 2. One recognizes that the vertical ~~supporting member~~ posts 9 extend only over a ~~slight~~ short distance parallel to the plane of the drawing so that they can be anchored in the reinforced box-like portions 6 which are centrally disposed in the ~~respective end portions~~ of ~~[[a]]~~ each droplet separator pack ~~[[et]]~~ 15. It is shown with this embodiment that the separator system 3 consists of a plurality of separator ~~packets~~ packs 15 of which only several are provided with the reinforced end portions. The remaining ~~packets~~ packs 15 which do not take over a carrying function for the ~~support ing construction~~ structure are formed as normal separator ~~packets~~ packs 15. The nozzles disposed at the spray pipes 8 are shown at 12 and are spaced from one another in such a manner that their spraying cones overlap so that the whole ~~[[range]]~~ area of the separator ~~packets~~ packs 15 can be cleaned. The individual lamellae of the separator ~~packets~~ packs 15 are indicated at 13.

Figure 5 shows two different variants for fastening the ~~supporting member posts~~ 9 in the box-like reinforced end portions 6 of the separator ~~packets~~ packs 15. According to the left variant one member 9 extends through the reinforced end portion 6 and is welded to the same. The ~~supporting member post~~ 9 extending through the reinforced end portion 6 forms outside of the reinforced end portion 6 an upper and a lower fastening flange ~~[[with]]~~ to which two additional ~~supporting member posts~~ 9 are screwed ~~[[which]]~~ and extend upwardly and downwardly and include the carrying elements 10 for supporting the spray pipes 8.

According to the right variant of figure 5 one ~~supporting member post~~ 9 is inserted into the reinforced box-like end portion 6 and is fixed in the same in an appropriate holding construction 14. It extends through a slot on the upper side of the end portion 6 upwardly.

Figure 6a shows a top view of a separator ~~packet~~ pack 15. This is indicated at 3 and has the reinforced box-like end portions 6 ~~respectively~~ in the center of its end portions.

Figure 6b shows a reinforced box-like end portion 6 in ~~[[the]]~~ side view with inserted ~~supporting member post~~ 9. Figure 6c shows a side view turned around 90°.

Figure 7 shows a support ~~ing construction~~ structure according to which rod-like ~~supporting member posts~~ 16 are not disposed at the separator ~~packets~~ packs 15 but between the same. The rod-like ~~supporting member posts~~ 16 carry the spray pipes 8

by means of brackets 17, and corresponding nozzles 12 are  
~~disposed at~~ mounted on the spray pipes.

One recognizes in figure 8 that the ~~supporting member~~  
posts 16 extend only slightly ~~in the direction~~ perpendicular to  
5 the axis of the ~~carrier~~ supports 2 so that also in this case a  
large free space is available between the ~~supporting member~~ posts  
16 for inspection purposes. The ~~[[range]]~~ area above the ~~carrier~~  
supports 2 can be ~~traversed~~ traveled. The fastening of the  
~~supporting member~~ posts 16 between the separator ~~packets~~ packs 15  
10 is realized by means of appropriate flange connections which are  
indicated at 18.